

LEVEL OF MANIPULATION OF DIGITAL RECORDING DEVICES IN LIGHT OF INTRODUCING ERRU SYSTEM IN EUROPEAN COUNTRIES

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Abstract

The tachograph is the oldest recording device, which belongs to the Group of ORD (On Board Recording Devices). It was introduced in the USA in 1939. Digital tachograph, the new advanced type of recording device in road transport, was introduced by Council Regulation No 2135/98 of 24 September 1998 with the beginning of May 2006, in the area of the European Union. "In contrast to its analogue predecessors the digital tachograph was introduced to facilitate the control of rest and driving times and to prevent manipulation attempt. In order to prevent abuse, it has been made the system of cryptologic keys and certificates stored in cards and devices, allowing creating explicit laws of users and authentic data recorded in, cards and devices. The Hasler Event Recorder was introduced in the 1920s. Regrettably, the construction of analogue tachograph, an original type of tachograph is used in road transport, encouraged to numerous frauds and counterfeits of social rules for drivers. Secure digital tachograph system is indisputably a means having the great influence on road safety, enforcement of the social conditions for drivers in road transport as well as supporting the fair competition between road transport undertakings. In order to better monitor the compliance of road transport with the rules in force, inter alia the provisions on usage the digital tachographs, the European Union regulation introduces the European Registers of Road Transport Undertakings (ERRU), a system that allows a better exchange of information between Member States.

Keywords: *digital recording device, procedure, safety, system, European Registers of Road Transport Undertakings*

1. Introduction

The tachograph, also known as a recording equipment, shall be installed and used in vehicles in order to register the driving time, other periods of work or of availability, breaks from work and daily rest periods of the driver. This recording equipment is also used for recording the distance travelled by the vehicle and speed of the vehicle. Tachograph should be installed in all motor vehicles registered in European Union, which are used for the carriage of passengers (in vehicles which are constructed or permanently adapted for carrying more than nine persons including the driver and are intended to this purpose) or goods by road (where the maximum permissible mass of the vehicle, including any trailer, or semi-trailer, exceeds 3.5 tonnes). The time caesura of the introduction of recording equipment and tachograph, is the year 1939, since when it has been stated the obligation of installation and usage of analogue tachograph in the United States of

America (USA). In Europe, the tachograph is used for more than 60 years [2].

The multiannual application of analogue tachograph showed that the construction of these devices allows numerous abuses by the interference with their proper functioning. Increasingly, there have been cases of manipulation in analogue tachograph records. These experiences become a contributory factor to the quest for a device that would prevent falsification of records of the recording equipment in road transport. These requirements was to meet the digital tachograph, as a device to ensure unambiguous assessment attempts to make changes to comply with the rules relating to the working time of a driver and speed limits. To be more precise it should be pointed that digital tachograph is only the part of the whole digital tachograph system, which consists of three main elements: the motion sensor, the digital tachograph and tachograph smartcards [3].

2. Development of digital tachograph system

Increasingly lower costs and high reliability of microprocessor systems have contributed to the rapid development of electronic systems used in motor vehicles. A scope of control possibilities has been expanded and new application areas have emerged in which the use of an advanced technology was not previously possible, such as real time control of quick-change processes through monitoring and recording.

For many years, global organisations have been marking out a direction of a developmental work related to the development of vehicle technologies for manufactures of vehicles and on-board devices. Such work is also related to the development of on-board recording devices, which may influence the improvement of the vehicle transport safety.

A digital tachograph implemented within the area of the European Union has replaced a worn-out and technologically obsolete analogue unit. A digital tachograph, which uses the latest cryptographic solutions, may make any misuse by drivers and employers more difficult. A digital tachograph also contains the mechanisms supporting the management of a vehicle fleet, which, from the point of view of vehicle owners and customers, will contribute to lower transport costs.

In the field of automotive industry, many advanced technologies and systems are used, such as multi-zone air-conditioning or a satellite navigation, which navigates a driver along their way and guarantees to reach their destination as quickly as possible while minimising transport costs. The improved safety and driving comfort is especially important for professional drivers or persons who often use a vehicle transport. The rehabilitation of injuries associated with staying in one, an unchanged position for a long time and an impact of shock on human body are very expensive and contribute to serious complications, including excluding a professional driver from performing their work.

The operation of a tachograph system may be a process, which is organisationally complicated and very expensive for operators. Especially alarming is a fact that Appendix No. IB does not contain precise calibration and inspection procedures, and some requirements thereof are frankly unrealistic (such as a requirement to check the accuracy by driving at speed of 50 ± 5 km/h over a distance of 1 km). The provisions of Appendix No. IB, which apply to the calibration and the inspection, are also differently interpreted in each EU Member State, and the author has not been able to receive an answer to the following basic question from the competent employees of the European Commission: *Must every workshop be equipped with a roller test stand, which is an alternative of a 1 km long measuring distance, and if not – can the verification be performed over shorter distances?* The above situation is a direct cause of a two-year delay in implementing the obligatory digital tachograph system in the EU countries.

The use of these parameters can significantly improve the accuracy and dynamics of speed measurements while eliminating a speed sensor. Such a solution is also much less susceptible to any attempts to falsify a measurement speed, as a speed can be calculated based on a number of parameters, and any interference with an on-board computer network is immediately detected by an on-board diagnostic network. The connection of a digital tachograph to a vehicle network is

facilitated, because digital tachographs are fitted with CAN interfaces. The economic benefits of this solution are considerable: a cost of an eliminated motion sensor (the price of which, according to information provided by manufacturers can be as high as 200 euros) and a cost of installing a sensor and wiring (installation of a tachograph will be similar to an installation of a radio).

Presently, many vehicles are already equipped with GPS systems used for the fleet management, and their information are available via a CAN bus. Such a system can be implemented at no cost while reaching the intended purpose, i.e. a maintenance-free digital tachograph that requires no calibration.

In the absence of a CAN system in a vehicle – a GPS receiver could be mounted inside a tachograph vehicle unit forming an integrated safe system.

Any attempt to undermine the requirements of Appendix No. IB will encounter an objection of both tachograph manufacturers, who have invested a lot of money in structures that meet these requirements, as well as European Union officials, who created them. However, contacts and exchange of information with the competent organisations responsible for the implementation of a digital tachograph in various countries of the European Union (VOSA – The Vehicle and Operator Services Agency in the UK, SNRA – The Swedish National Road Administration in Sweden) reinforces the author's belief that so formulated research topic needs to be urgently taken up.

Considering the significant meaning of control functions of digital recording equipment, it was necessary to develop technical solutions, enabling remote control of digital recording equipment, using intelligent transport systems, including the global GPS location system (Global Positioning System). Changes in European legislation, according to the provisions of regulation (EU) No 165/2014 of the European Parliament and of the Council of 4 February 2014 on tachographs in road transport, repealing Council Regulation (EEC) No 3821/85 on recording equipment in road transport and amending Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonisation of certain social legislation relating to road transport, confirmed the legitimacy and desirability of researches conducted by and obtained as a consequence of their results, including, in particular, in the scope of use of recording equipment, connected to the global satellite navigation system, as a means of enabling the automatic registration of the vehicle's position and supporting the control function of the system.

With regard to the communication on the distance between the recording equipment, digital tachograph system plays a significant role in enforcement instrument for control services, authorized to the roadside checks and inspections at the premises of undertakings.

Consideration for the fair competition and conducting the commercial activity regarding to the regulations of existing Community law require the uniform application of common rules. The scale of conducted carriages by road at the global level of the economic market of the European Union brings the need of closer monitoring of compliance with the regulation on road transport throughout imposing on the transport operators and drivers the obligation of the implementation of the digital recording devices and making records of drivers' activities. Because of the safety, reasons in road transport the obligation of registration of rests and driving periods as well as records of journey and speed of driving have the special meaning. Experience with the use of analogue recording devices has presented the serious unreliableness of the monitoring system of working time of drivers in road transport, based on such analogue devices. Digital recording equipment and multi-element, completed system based on digital data gives the opportunity to monitor the compliance with legal provisions on driving and rest periods, as well as it allows to reconstruct the history of carriages conducted by the driver.

In 2019, a new generation of digital tachograph (the smart tachograph) will be introduced on the market, and will be mandatory for all newly registered commercial vehicles. Within next fifteen years, the smart tachograph will be mandatory for all commercial vehicles in the scope of the tachograph regulation, operating within the territory of European Union. Once operational, one

¹ OJ L 60, 28.2.2014, p. 1.

of the functions of the smart tachograph will be to automatically record the exact geo-positioning of vehicle and driver at the start and the end of the driver's working day, as well as every three hours of cumulated driving time. This information will be stored in a secure way both on-board vehicle and at the company site, as requested by the EU rules, and thus will be downloadable both during roadside and company checks. This certain tachograph function will be essential in controlling the period over which vehicle and driver operated on a territory of a given Member State.

Hence, suitable worked out and developed, allowing work in on-line mode, the system of intelligent digital tachograph shall eliminate the infringements in road transport in the range of rules on driving and rest periods for drivers. This only will be achieved under the condition of compatible functioning of ERRU and registering of all cases of infringement against tachograph rules, which cause the loss of good repute of transport manager of road transport operator. Furthermore, to provide the security of data recorded and stored in digital tachograph system, it must be ensured the permanent monitoring of the level compliance with the provisions of European Union law on road carriage and social rules for drivers. Intelligent tachograph system will be the necessary and effective method for control of compliance with the good repute condition in road transport and for risk estimation of the infringements concerning the provisions on working time rules for drivers. Consequently, strengthening the effectiveness of the certain elements of digital tachograph system and providing its interoperability, as well as the data security against its loss and change, will create the good instrument, countering the road accidents, collisions and improving social conditions for the drivers. It directs to the statement on the same resonance of the digital tachograph system and ERRU.

3. Control of digital recording devices

Introduction of the digital tachograph in road transport had undeniably ensure:

- improving the efficiency and effectiveness of control of road haulage companies in road transport,
- the relevant standards in the field of social legislation and its harmonization in all the Member States of the European Union,
- strengthening the principles of fair competition,
- improving safety in road traffic.

The digital tachograph is a very important on-board device, used in road transport, due to control possibilities and enforcement of compliance with the legal provisions concerning the conditions of transport and social rules for drivers. Control of the road carriage (road transport and non-commercial carriage by road) it is the statutory task of the Road Transport Inspection (Article 50 of the Act of 6 September 2001 on road transport, Law Journal 2007, No. 125, position 874, with changes). Additionally, police officers, Customs officers, border police inspectors, and inspectors of the National Labour Inspection are also entitled to conduct the control of road haulage in area of the installation of tachographs in vehicles and the registration of the working time of drivers. The procedure of control on compliance with the provisions on periods of driving, minimum breaks and rest periods in road transport (both during roadside checks and checks in permission), as well as the required standard equipment of controllers and the list of basic elements which must be checked are determined by the regulation of Minister of Infrastructure of 2 September 2009 on the control of the carriage of goods by road (Law Journal No. 145, position 1184). This regulation implements the directive 2006/22/EC of the European Parliament and of the Council of 15 March 2006 on minimum conditions for the implementation of Council Regulations (EEC) No 3820/85 and (EEC) No 3821/85 concerning social legislation relating to road transport activities and repealing Council Directive 88/599/EEC (Official Journal L 102, 11/04/2006 P. 0035-0044).

Optional equipment of the inspector includes especially devices able to make photocopies and photographic documentation.

The list of basic points, which should be covered by roadside checks, was defined in annex 5 to the mentioned above regulation of the Minister of Infrastructure on the control of road carriage and it includes the following elements:

- daily driving periods, breaks and daily rest periods,
- weekly driving periods and weekly rest periods,
- cases exceeded the permitted speed of the vehicle,
- sheets from previous days, which should be in the vehicle in accordance with article 15, paragraph 7 of Council Regulation (EEC) No 3821/85 or data from the same period on the driver card, in memory of the digital tachograph or print with this device,
- instantaneous speed reached by the vehicle, saved by the digital tachograph by not more than the previous 24 hours of use of the vehicle,
- correctness of operation and use of analogue equipment and digital recording equipment or record sheets or driver card.

Nevertheless, to the control of vehicle unit, driver card data and printouts of the digital tachograph shall apply the provisions of § 10 of the regulation of the Minister of Internal Affairs and Administration of 18 July 2008 on the control of road traffic (Official Journal No 132, position 84, with changes). Inspector should check data in the memory of the digital tachograph and driver card through the insertion of the control card to the digital tachograph, and then display and viewing them, print or download using devices for copy the information. If the driver does not have a driver card or it is unable to use due to the damage, the inspector checks the data contained in the memory of the digital tachograph on the basis of the printout. The driver is required for writing on copy of printout, made by the inspector, his name and surname, driver card or driving licence number and signature.

Transport undertaking is liable for infringement dealt with obligation of installation and usage of digital tachograph, found by inspections. The penalty is imposed on the transport undertaking by administrative decision. Amount of fines for such infringement are set out in the annex no. 3 to the Act on road transport. Part 6 of annex no. 3 specifies 15 infringements dealt with digital tachograph and assigned them a penalty ranging from 100 to 5.000 PLN. Below is a modified extract from the annex no. 3 to the Act on road transport for infringements of the provisions on the use of the digital tachograph.

It must be underlined that the driver is also liable for infringement dealt with improper usage of digital tachograph. The infringements and penalties are described in annex no 1 to the Act on road transport. For instance, for performing carriage by road using vehicle with digital recording equipment with illegal additional device influenced on incorrect function of digital tachograph the driver should be punished fine of 2000 PLN.

The ratio of issued decisions on the imposition of a penalty payment to the number of checked vehicles in the year 2017 equals 18.4% (14.4% according to inspections of vehicles registered in Poland and 17.6% – vehicles registered abroad). In view of the comparison of the results of the checks carried out by the Road Transport Inspection from the beginning of its existence, it should be underlined the systematic decline in the number of checks with the imposition of the penalty by administrative decision in proportion to the number of controlled vehicles. The following chart shows the increase in compliance with the provisions of the transport by carriers, which covers the period from the beginning of activity of the Road Transport Inspection (Fig. 1).

The results of the roadside checks carried out by inspectors of the Road Transport Inspection indicate a statement of more than 172 000 infringements (in accordance with the annex to the Act on road transport). Approximately 70% of infringements were related to the provisions concerning driving and mandatory breaks and rest periods of drivers, over 15% of infringements were related to improper use of the recording equipment, while 10% constituted a violation of the requirements for the possession of the required licenses, certificates of accomplishment of the non-commercial, or documentation of drivers. Violations related to not paying by carriers the mandatory tolls on

national roads is about 2% of the total number of infringements. The structure of infringements shows the Fig. 2.

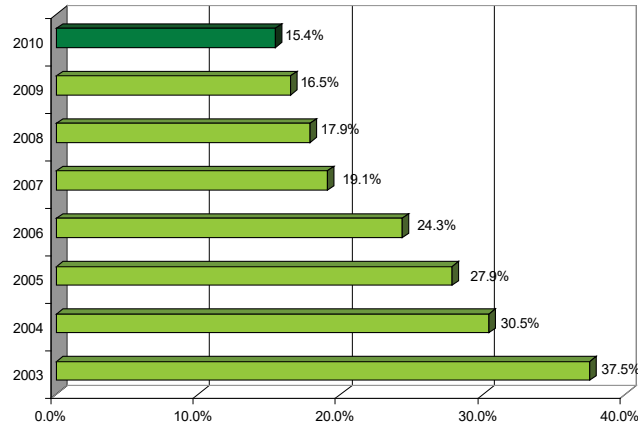


Fig. 1. The increase in compliance with the provisions of the transport

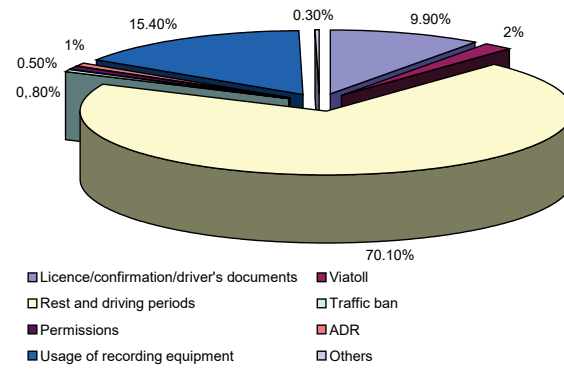


Fig. 2. The structure of infringements in road transport

Of the total number of approximately 65 000 of infringements related to the non-observance of rules on social legislation for drivers in road transport, the most common is not allowed reduction of daily rest periods and driving time without required break. A detailed list of the number of infringements noted in respect of the working time of drivers shows the Fig. 3.

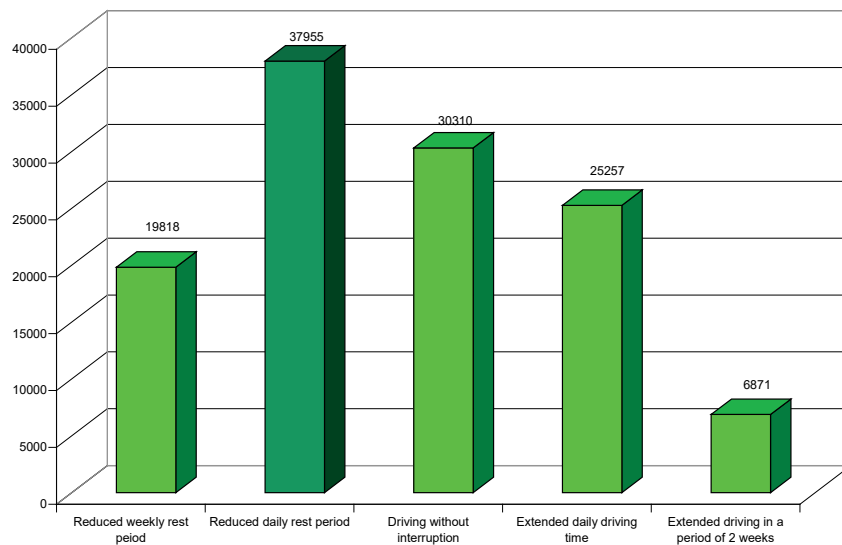


Fig.3. The number of infringements in road transport

According to infringements referred to compliance by the drivers and traders with the provisions concerning the use of recording equipment very common are cases of incorrect use of the recording equipment or the incorrect use of recorded sheets. A detailed list of the number of infringements noted in the use of the recording equipment shows the Fig. 4.

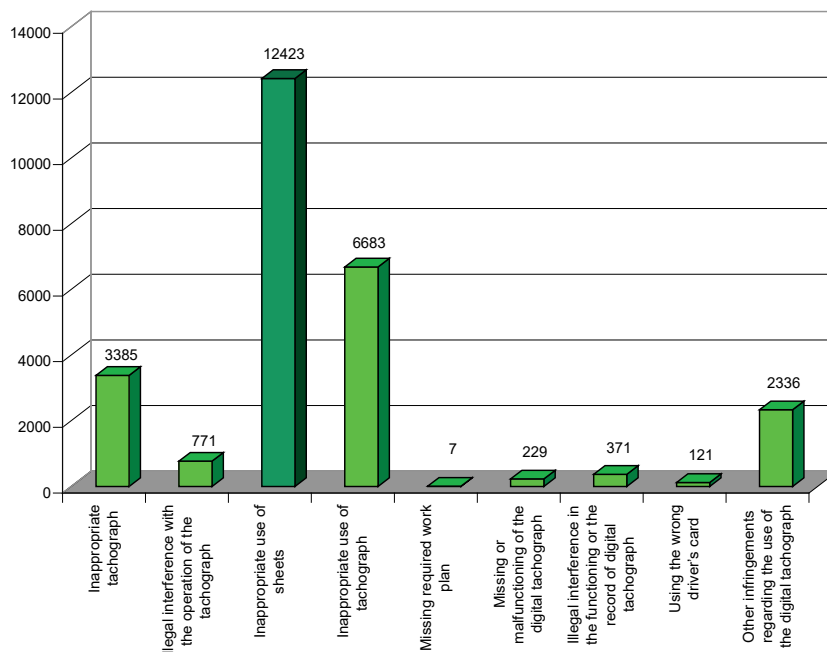


Fig. 4. The number of infringements in road transport in light of using recording equipment

Violations of the standards of the working time of drivers will also rise to the liability of the driver in the form of fines levied by the criminal mandate. This responsibility is independent of the responsibility of transport undertaking and aims to more effective compliance with the provisions concerning the standards of driving and mandatory breaks (Fig. 5).

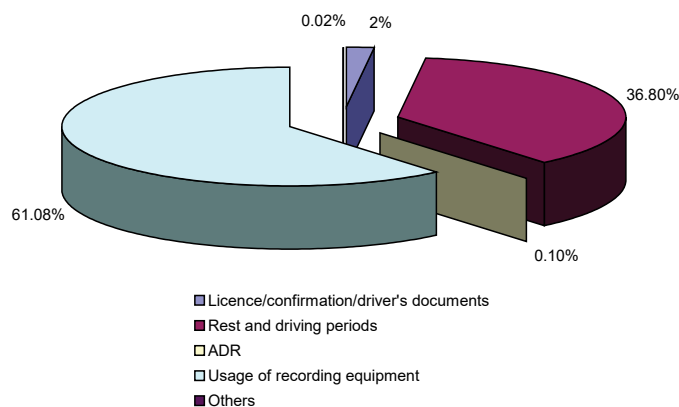


Fig. 5. The infringements number of standards of driving and mandatory breaks

As a result of the checks carried out in enterprises engaged in road transport in 2010 it was issued 2077 administrative decisions on the imposition of fines total 25,000,000 PLN.

As a result of checks carried out at the premises of undertakings, inspectors of the Road Transport Inspection claimed more than 243,000 infringements. More than 62% of the infringements concerned the incorrect use of the recording equipment, 36% of infringements related to the non-observance by the drivers of the provisions concerning driving and mandatory breaks and rest periods, but approximately 1% were infringements referred to the violation of

the requirements for the possession of the required licenses, certificates of accomplishment of the non-commercial, or documentation of drivers. The detailed structure of the deficiencies identified as a result of the checks on the premises of the transport undertakings shows the following chart.

To achieve such tasks Member States should make the appropriate methodology and circumstances of conducting such additional checks. Therefore, the scope of these checks might be included in the national control strategy. Such methods as: method of two check points with the analysis of speed or distance, method of one check point with a detailed analysis of data or the method of one check point based on the technical inspection, increase the effectiveness of control. Ultimately, the officer could immediately order to carry out other vehicle inspection in the workshop.

The method of two checkpoints with the analysis of the actual speed or distance. Using this method of inspection, officers could measure actual speed of the vehicle at a specific point using portable or installed in some place cameras, before stopping the vehicle. Then, they could copy file containing details of speed over the last 24 hours from on-board memory unit and compare registered speed in a given point with the speed measured several kilometres before. At the checkpoint, this method requires only the comparison of two numbers after reading a file containing details of speed over the last 24 hours.

4. Summary

Appropriate functioning of all elements of the system of digital tachographs enable to achieve the intended purpose. In general, the guarantee of security of the whole digital tachograph system is the closest cooperation of all elements of these systems and the most correct functioning of each element. However, it must be underlined that in order to prevent the manipulation of the digital tachograph, first of all it is very important to provide for:

- a range of technical measures – the tachograph to be connected to a Global Navigation Satellite System device to automate the recording of the daily journey start and end location, a remote (wireless) communications function to provide a signal, only on request, to allow an enforcement officer to assess whether to stop the vehicle for further checks and a harmonised interface to allow the use of Intelligent Transport Systems (ITS) with the tachograph;
- a requirement to ensure enforcement officers are appropriately trained, establishing the methodology for initial and continuing training.

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